

**Methods:** Literature search was performed to identify eligible population-based cohort studies that examined cancer incidence after solid organ transplantation. Summary standardized incidence ratios (SIRs) and the corresponding 95% confidence intervals (CIs) for each cancer were calculated using random-effects meta-analysis.

**Results:** A total of 19,269 incidence cancers (excluding non-melanoma skin cancer) occurred in 282,032 transplant recipients from 16 studies. SIRs for a wide range of cancers were elevated, including several infection-related cancers (e.g., non-Hodgkin lymphoma [NHL], Hodgkin lymphoma and Kaposi sarcoma) and some infection-unrelated cancers (e.g., lung and colorectal cancers). The most common cancers with elevated risk among transplant recipients were NHL (summary SIR = 12.55; 95% CI, 9.65–16.32) and lung cancer (summary SIR = 1.87; 95% CI, 1.61–2.17). Organ-specific analysis suggested a significant difference in NHL risk by transplanted organ, with highest risk observed in lung recipients.

**Conclusions:** Organ transplantation is associated with increased risk for various infection-related and unrelated cancers, and the increase in cancer risk may differ by transplanted organ.

## Environment/Occupational

### P15. Urinary Bisphenol A and Phthalate Metabolite Concentrations and the Secondary Sex Ratio: The Life Study

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**Purpose:** With the lack of research on non-persistent chemicals as exogenous factors affecting human sex selection, this study aimed to evaluate the association of urinary bisphenol A (BPA) and phthalate metabolite concentrations with the secondary sex ratio (SSR), defined as the ratio of male to female live births.

**Methods:** A total of 220 couples with a singleton birth in the Longitudinal Investigation of Fertility and the Environment (LIFE) Study, in which couples were enrolled prior to conception, prospectively followed until pregnant, and asked to report birth outcomes including infant sex, were used for the analysis. Using logistic regression models accounting for potential confounders, we estimated the odds of a male birth per standard deviation change in log-transformed maternal, paternal, and couple urinary BPA and 14 phthalate metabolite concentrations (ng/mL) measured upon enrollment.

**Results:** Paternal urinary BPA was associated with an excess of female births, when separately modeling for paternal chemical concentrations (odds ratio [OR], 0.69; 95% confidence interval [CI], 0.48–1.00) and jointly modeling for couples' chemical concentrations (OR, 0.59; 95% CI, 0.39–0.91). In the couple-based models, maternal mono (2-isobutyl phthalate) (OR, 1.80; 95% CI, 1.12–2.88) and monobenzyl phthalate (OR, 1.90; 95% CI, 1.13–3.20) were associated with an excess of male births.

**Conclusions:** This study suggests that paternal but not maternal BPA exposures may decrease the SSR; meanwhile, select maternal but not paternal phthalate exposures may increase the SSR. Given the absence of previous investigation, these partner-specific associations of non-persistent chemicals with the SSR need to be attested in future studies.

### P16. Prevalence of Advanced Periodontitis Among Individuals with Detectable Urinary Phthalate Metabolites: A Cross-Sectional Analysis of the 2009-2010 National Health and Nutrition Examination Survey

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**Purpose:** To determine if exposure to phthalate plasticizers is associated with an increased prevalence of advanced periodontitis, a chronic inflammatory condition that results in the loss of supporting bone around teeth. Recent studies have suggested that phthalates may increase neutrophil and lymphocyte production of IL-1, a pro-inflammatory cytokine that enhances osteoclastogenesis and resultant bone resorption processes.

**Methods:** Dental examination and urinary phthalate metabolite data from 200 subjects (age  $\geq 30$  years) in the 2009-2010 National Health and Nutrition Examination Survey were examined to determine associations between the prevalence of advanced periodontitis and exposure to 15 phthalates. Logistic regression models examined associations between the prevalence of

moderate-to-severe periodontitis and dichotomous detection limit status for 15 urinary phthalate metabolites. Models were weighted using survey-specific factors and adjusted for confounding by age, gender, ethnicity, income-to-poverty ratio, and 30-day cigarette consumption.

**Results:** Mono-(3-carboxypropyl) phthalate was most strongly associated with an increased prevalence of advanced periodontitis (adjusted pOR: 2.188; 95% CI: 2.165–2.212), followed by mono-(2-ethyl)-hexyl phthalate (adjusted pOR: 1.298, 95% CI: 1.293 – 1.303. Following adjustment for confounding, mono-cyclohexyl phthalate was less strongly associated with an increased prevalence of advanced periodontitis (adjusted pOR: 1.031, 95% CI: 1.022 – 1.041).

**Conclusions:** Exposure to di-n-octyl phthalate and di-2-ethylhexyl phthalate through consumer products and building materials may be associated with an increased prevalence of moderate-to-severe periodontitis among adults. Further studies are needed to establish temporal relationships, as well as biological mechanisms related to the exposures and the outcome.

### P17. Shift Work and Sleep Quality Among Urban Police Officers

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**Purpose:** To assess associations of shift work with sleep quality in police.

**Methods:** Participants were officers enrolled in the Buffalo Cardio-Metabolic Occupational Police Stress (BCOPS) study (2004-2009). A work history database, containing day-by-day account of start time and work hours, was used to define shifts as day (start time = 7 or 8 am), afternoon (4 pm) or night (8 or 9 pm). Sleep quality (good/poor) was determined using the Pittsburgh Sleep Quality Index (PSQI) questionnaire. Poisson regression was used to estimate prevalence and prevalence ratios (PR) of poor sleep quality associated with shift work.

**Results:** The prevalence of poor sleep quality was 54% (95% confidence interval [CI]: 49.1, 59.4) among the 363 officers with complete data. Half of the study participants worked on day shift. Prevalence of poor sleep quality was 70% (PR=1.70, 95% CI: 1.34, 2.14) higher among night shift officers and 49% (PR=1.49, 1.17, 1.91) higher among those on afternoon shift relative to officers working on day shift. The association also depended somewhat on smoking status, body mass index, and physical activity. Differences in prevalence of poor sleep quality between night and day shift officers were larger among smokers, overweight/obese participants, and those with low physical activity levels.

**Conclusion:** Results indicate that night shift work is associated with poorer sleep quality among police officers. Future longitudinal studies could assess whether shift work predicts poor sleep quality and elucidate mechanisms by which lifestyle factors moderate this association.

### P18. Mortality of Enlisted Men Who Served on Nuclear-Powered Submarines in the United States Navy

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**Purpose:** Sailors stationed on nuclear-powered submarines spend several years in tightly enclosed environments and little is known about their mortality experience.

**Methods:** This is a retrospective occupational cohort mortality study of 85,033 enlisted men who served on nuclear-powered submarines in the United States Navy between 1969 and 1982. The study uses within-cohort Poisson regression analyses by duration of submarine duty and Standardized Mortality Ratios (SMRs) for comparisons with mortality of the U.S. general population.

**Results:** A total of 3,242 deaths occurred in 27 years (1,805,581 person years) of follow-up. Poisson regression Relative Risks (RR, 95% Confidence Interval) for ischemic heart disease mortality were 1 (reference), 1.37(1.07,1.75), and 2.02(1.13,3.35) for those with <5 years, 5-<10 years and  $\geq 10$  years submarine duty, respectively. All-cause SMR was 70 (95% Confidence Interval 67,72), with substantial deficits for most cause-of-death categories. The prostate cancer SMR was 200(117,321) but the RR (per 5 years submarine duty) was 0.94(0.26,3.1). The suicide SMR among the subgroup with less than 1 year stationed on nuclear-powered submarines was 133(109,161).